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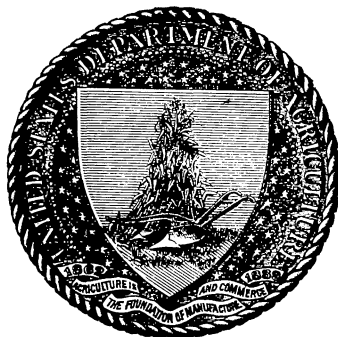
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U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN No. 117.

SHEEP, HOGS, AND HORSES IN THE PACIFIC NORTHWEST.

I. SHEEP HUSBANDRY, by James Withcombe, V. S., Vice Director of the Oregon Experiment Station; II. HOG RAISING, by Hiram T. French, M. S., Agriculturist of the Idaho Experiment Station; III. THE HORSE INDUSTRY, by S. B. Nelson, D. V. M., Professor of Veterinary Science in the Washington Agricultural College.



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LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF PUBLICATIONS,

March 21, 1900.

SIR: The papers included in this publication were prepared by the authors in accordance with your instructions. All of them being short, and relating to subjects of general interest to stock raisers in the Pacific Northwest, it has been deemed best to combine and issue them in a single bulletin. Therefore, in compliance with your wish that they be prepared and published for popular distribution, they are issued as Farmers' Bulletin No. 117.

GEO. WM. HILL,
Editor.

Hon. JAMES WILSON,
Secretary of Agriculture.

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Bethesda, Md.

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SHEEP, HOGS, AND HORSES IN THE PACIFIC NORTHWEST.

SHEEP HUSBANDRY IN THE PACIFIC NORTHWEST.

BY JAMES WITHCOMBE, V. S.,
Vice Director of the Oregon Experiment Station.

CLASSIFICATION OF BREEDS.

The domestic sheep is cosmopolitan, probably more so than any other farm animal. Some breeds are capable of adaptation to many varying conditions of altitude and soil, thriving alike on the rich lowlands but a few feet above the sea level and upon the mountain heights, where scanty but rich and tender herbage is found.

The many breeds of sheep owe their existence largely to local environments, of which altitude plays a conspicuous part. For economic purposes all breeds may be divided into three classes, each having its characteristic habitat:

First, the long wools, which feed upon the luxuriant pastures of the alluvial soils in humid climates.

Second, the Downs, or middle wools, which delight in the less luxuriant herbage of the table and hill lands, particularly those of limestone formation.

Third, the Merinos, which revel in the sweet, tender grasses of mountain heights.

These breed characteristics are the unerring guides by which the breeder should be governed in making selections to suit local conditions. The most important item connected with an embarkation in sheep husbandry is proper selection, guided by the basic principle of harmony between breed and environment. It would be folly indeed to take the ponderous long wools to arid or semiarid regions, and expect them to develop large typical bodies and grow long, lustrous wool from the natural herbage furnished by these lands. In the absence of suitable natural conditions, artificial means, such, for instance, as irrigation, may be employed in the development of succulent plants. The selection of this breed, however, for this character of soil is of doubtful expediency, and much better results could be confidently looked for with breeds that are better suited to such conditions.

In the pastoral regions of the Pacific Northwest conditions are not

radically dissimilar to those found on the mountains of Spain and some of the hill lands of Great Britain; hence, breeds of sheep that have thriven there may safely be relied upon when introduced into this region. The Merino, as an intensely cosmopolitan sheep, stands without a peer. He thrives on the rich alluvial bottom lands, presenting a rotundity of form that would do credit to some of the smaller mutton breeds, and yields annually a heavy fleece of admirable wool. We find this same hardy, contented breed, in flocks of 2,000, grazing upon the plains and mountain heights, industriously nipping the tender herbage, without a sign of constitutional defect in the whole flock. It is these peculiar traits of character that so eminently fit the Merino for transient sheep husbandry. This breed largely predominates in the semi-arid regions, and is found to be perfectly suited to conditions prevailing there. The ewes cross well with the Downs and long wools, and lambs from these crosses are quite popular with the butcher and feeder.

Within the past few years sheep husbandry in the pastoral sections of the Pacific Northwest has been completely revolutionized. Formerly the millions of sheep grazed upon these plains were kept for the special object of wool growing. Mutton was not even considered as a factor in the industry, there being no available market for the disposal of this product. Less than ten years since, range mutton was selling at 25 cents per quarter. Fortunately for the industry these conditions no longer exist, as at present mutton is paramount in value to wool, while the market lamb is destined in the near future to become the primary consideration.

THE RANGE SHEEP INDUSTRY.

The range system.—The range man usually owns a small homestead on a creek bottom, of sufficient area to produce hay enough to sustain the flock during a period of snow in the winter. The breeding of sheep in these sections is conducted upon a large scale, many breeders owning their thousands and depending almost entirely upon the public domain for pasturage. The flocks are generally divided into bands of 2,000, which are placed in the charge of a herder.

The overstocking and consequently diminished productiveness of the range has forced the sheep breeder to adopt better and more economical methods for handling his flock. Only a few years back there was little, if any, attempt made to provide winter feed for the flock, but at present no prudent breeder would be willing to risk his flock's going through the winter without making ample provision for at least two months' feeding. The present range system is still somewhat primitive in character. A good or bad season too frequently means profit or loss to the flock owner. This, however, can be largely obviated, as there is but little excuse for retaining ewes so low in the vital scale at lambing time that their maternal instincts and milk secretions are entirely wanting, necessarily causing the lambing yard to be strewn

with a great number of puny outcasts, a large percentage of which ultimately succumb to cold and hunger. Feed can be grown cheaply in these sections, as there are large areas that can be transformed from sage-brush plains to alfalfa meadows and cornfields. This feed can be put up in such a manner that it may not only be used as a maintenance ration, but also to fatten sheep in the winter months, when mutton is selling for a good figure.

The present system of disposing of the feeders and mutton sheep in the late spring and early fall, and the lambs at weaning time, is not altogether advantageous to the grower, as at these seasons there is usually a depressed market, and prices necessarily rule low. The breeder of sheep should, whenever it is practicable, prepare them for market, and he should arrange to have them ready at a time when they will command the highest price. Of course, local conditions in many instances preclude winter fattening of sheep on the range, but there is a great number of sheep ranches that are favorably located for winter feeding.

Winter feeding.—The wheat lands over a great portion of eastern Oregon and Washington will produce good crops of corn, which in the form of silage can be profitably utilized for sheep. At the Oregon experiment station last winter some Cotswold and Shropshire ewes were fed daily about 3 pounds per head of corn silage, one-half pound of oats, and what clover hay they could eat up clean. They became very fat on this feed. This silage can be put up very cheaply, with the present inexpensive method of constructing silos, and, if fed with a very little of alfalfa hay and grain, prime muttons and lambs can be turned off at any time during the winter, when prices are very satisfactory.

For the general flock, especially the breeding ewes, a little succulent feed in the form of silage, fed once a day during the winter, in addition to alfalfa, or vetch hay, or grain, will be wonderfully conducive toward maintaining the constitutional vigor of the flock, and will practically eliminate all danger of ewes' disowning their newborn lambs in the spring.

Although there are many apparently insurmountable obstacles in the way of the practical application of this system on a scale sufficient to accommodate the needs of sheep husbandry as usually conducted upon the range, under persistent effort these obstacles will disappear and the plan will be found feasible.

How to feed.—Sheep are peculiarly sensitive and will quickly object to feed that has become tainted by coming in contact with their feet or droppings. This is governed somewhat by the degree of hunger, but no sheep will fatten upon feed which it consumes reluctantly; hence, for best results, feed free from all objectionable taints should be provided. The too common practice of the rangeman of feeding his flocks on the ground is not to be commended. For feeding hay or other

roughage this method may be partially successful in arid or semiarid sections; but wherever the ground becomes muddy or befouled with the excrement of animals it will be found to be wasteful and unsatisfactory. This system of feeding on the ground precludes the use of such food stuffs as oats and mill feed. It is a better plan to provide feed racks with troughs attached. Equipped with these, whenever an exigency arises the flock can be economically fed any kind of grain or mill feed. These racks can be constructed cheaply, and many styles of them are in use. The one represented in fig. 1 has been used by the author for a number of years and found to be satisfactory. The racks can be so arranged that feed may be put into them directly from a wagon. If cut silage is fed, this should be put in first, as it will fall through the rack into the troughs. After the silage is properly distributed the racks can be filled with hay.

The rack represented in fig. 1 is 12 feet long. The frame is 3 feet 6 inches high and 2 feet 1 inch wide, and is made from 2 by 4-inch

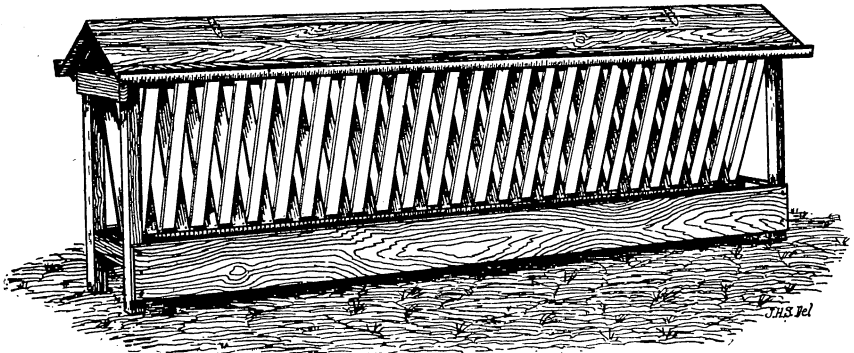


FIG. 1.—Rack with troughs for feeding sheep.

lumber. The bottom crosspieces, the upper edges of which are 1 foot 1 inch from the ground, and the two pieces running lengthwise on the upper portion of the rack, are framed into the posts. The upper crosspieces are $1\frac{1}{2}$ by 6 inches, and are nailed to the outside of the posts. A 2 by 4-inch scantling runs lengthwise in the center of the rack and is framed to the bottom crosspieces. To this is nailed at the bottom a 1 by 3-inch strip for the trough to rest on. Two boards, 1 foot wide and $1\frac{1}{2}$ inches thick, placed each side of the center piece make the bottoms of the troughs, and an outside board 1 by 8 inches extending up $3\frac{1}{2}$ inches above the floor of the trough completes it. The slats for the rack are $2\frac{1}{2}$ by $\frac{7}{8}$ inches, and are placed $2\frac{1}{2}$ inches apart. For outdoor use in a wet climate the rack should be roofed. This is done by nailing three pairs of rafters of the desired pitch on the top of the frame to which, on one side, one-half inch shiplap, or weather-boarding, is nailed lengthwise. The other side of the roof should be attached with hinges, so it can be lifted up when feed is to be placed in the rack.

A $\frac{1}{2}$ by 2-inch strip should be nailed to the eaves so as to form a sort of eaves-trough to prevent water from dripping on the sheep while feeding.

When fed in large flocks the sheep should be driven from the feed yard during the time the racks are being filled; this will overcome the tendency to overcrowding and prevent injury to the sheep from the wagon and team. The quantity of this feed to be fed should be governed largely by the appetite of the flock, but it is not usually advisable to feed over 3 pounds of silage per head daily. For sheep weighing 125 pounds, about 2.5 pounds of silage and 1.5 pounds of hay will be ample; and if one-half pound of grain or bran be fed, slightly less hay will suffice. This will depend largely upon the condition of the flock and the severity of the weather. If grain is fed it is not a proper plan to mix it with coarse feed, as the sheep are inclined to root out and waste this feed in their efforts to get the grain.

The feeder should carefully look after all the smaller details connected with the winter feeding. The feed racks and troughs should be kept clean. Water should be convenient to the flock at all times, especially so if hay is fed in any considerable quantity. Salt is an indispensable adjunct to health and thrift, and should be kept within reach of the sheep so they can have it at their pleasure, or be supplied once or twice weekly. Long intervals between salting of the flock are frequently responsible for functional derangements of the digestive organs, accompanied at times with fatal results.

The range lamb.—The Western lamb trade is rapidly assuming mammoth proportions, and the present system of rushing them into the market by the train load demoralizes the trade and reduces the price to the grower. These lambs are cheaply grown, as no expensive concentrated feeds are used for their development. After shearing, or in the early part of the summer, the ewes and lambs are started for the mountains, where the tender, succulent grasses, pure water, and enjoyable shade contribute to the health and thrift of the flock. The environments offered by these mountain ranges make them ideal summer pastures for suckling ewes; hence, the lambs grown there are noted for the production of typical carcasses of firm flesh. In the early fall or late summer these lambs are brought out of the mountains and shipped in large numbers to the markets of the middle West, where they are either slaughtered at once or sent to feed yards to be carried over in anticipation of better markets.

SHEEP HUSBANDRY IN WESTERN OREGON.

Character of the industry.—Sheep husbandry in this section is conducted upon entirely different lines from those of the range system. Here we find a humid climate and a rich alluvial soil, suitable to the growth of a great variety of succulent forage plants. Ordinary mixed farming is carried on in this section, and sheep are too frequently kept

as mere scavengers to glean over the summer fallows, or are regarded simply as weed exterminators. The flocks here are usually small and represent the mutton breeds, as mutton is more profitable than wool. Farm surroundings here are exceedingly favorable for the economical production of mutton, and marvelous growths have been secured with the mutton breeds. Possibly there are but few sections of country to which the old Spanish proverb, "The sheep's hoof is golden," is more applicable than in this region. With wheat growing a prominent factor, mutton production will always be found a profitable supplement. These two industries go admirably together. Among live stock, sheep are preeminently soil renovators, and, with one possible exception, that of butter, no product of the farm takes less from the land in proportion to its market value than wool and mutton. Then, again, the excreta from sheep are more perfectly utilized as fertilizers than those from any other farm animal. This is due to their comparatively even distribution over fields that are grazed by these animals.

Annual forage crops for pasture.—In the event of the production of mutton being made strictly supplementary to grain growing, farming of more or less intensive character should be adopted. This involves the growing of clover, rape, vetches, and other forage plants as rotation crops; these to be pastured off or to be harvested as hay for winter feeding. A popular method is to grow two successive grain crops, following these with clover or some cultivated crop. A good fall sheep pasture is secured by sowing 3 or 4 pounds of Dwarf Essex rape seed per acre with spring oats. The rape makes a good growth in the early part of the season and develops sufficient root growth to enable it to withstand the summer. It revives with the coming of the fall rains and often makes an excellent pasture for lambs or breeding ewes until late in the season. Some of our most progressive wheat growers take two or three consecutive crops of grain, and then seed down to clover. The first crop of clover is harvested for hay, to be fed to the flock during the winter. The clover is then pastured for one or two years with sheep; afterwards the land is broken again for grain. This practice is found to be very helpful in restoring and maintaining the fertility of the land, as well as in making wool and mutton contribute materially to the revenues of the farm.

Another plan is to sow the fallow land to rape about the 1st of June. This will be ready to pasture within six weeks or two months, and the amount of forage secured from a piece of land thus treated would be a revelation to many farmers. The land is plowed and sown to wheat about the 1st of October, and, in a normal season, by the following February, a luxuriant pasture will be furnished for the ewes and lambs, or for fattening sheep.

The sheep hurdle.—No well-regulated sheep farm is complete in all of its appointments without the hurdle (Fig. 2). This portable fence is an indispensable factor in the successful and economical handling of

the flock on a small farm or where the system of mixed husbandry is practiced. Many opportunities will be presented during the year where it can be used advantageously in dividing pastures or for confining sheep upon certain portions of a field. It will be found invaluable as a quick method for constructing pens, either large or small, at shearing time, or for docking, tagging, or dipping. In the winter season these hurdles are a great convenience for inclosing feeding yards, lots for exercise, and small plats for subdivisions of the flock.

In fig. 2 is shown a view of the hurdle in place, with a pair of supports. The panel is made of four 1 by 3-inch plank 12 feet long, crossed by three pieces of the same size and 3 feet long, one being placed in the middle and the others 6 inches from the ends. The spaces between the planks, beginning at the bottom, are 6, 8, and 10 inches. The braces which are crossed for the supports are 4 feet long and 1 by 3

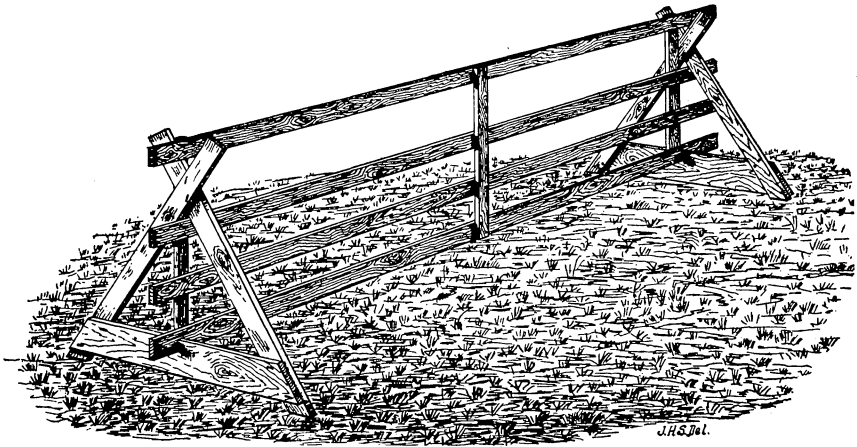


FIG. 2.—Panel of hurdle fence.

inches in size. The sill is of 1 by 6-inch stuff, the lower edge being 3 feet $5\frac{1}{2}$ inches long, and the upper 2 feet $10\frac{1}{2}$ inches long, with a notch at the middle 2 inches deep and $2\frac{1}{2}$ inches wide for the ends of the panels to rest in. The braces should extend an inch or more below the sill to prevent the hurdle from rocking. In use, each of these supports serves to hold up as well as to join together the ends of two succeeding panels. To prevent the fence from being blown over, a stake should be driven about every 50 feet, to which the hurdle should be wired down.

The details for the winter management of the flock are probably much less important here than in almost any other section of the country. The winters are usually open, and much succulent feed can be found in the pastures and the grain and stubble fields during this season. It is not advisable, however, even when conditions are most favorable, to depend entirely upon the open field for the wintering of the flock. Grave mistakes have frequently been made by farmers in

this respect. Sheep at times will appear to the eye to be doing well, while in reality they are rapidly losing flesh. The old adage that "the eye of the master fatteneth his cattle" is somewhat misleading, and will not apply to the flock. The hand alone can be relied upon to reveal the true condition of the sheep.

Amount of mutton one acre will produce.—To illustrate the possibilities within the grasp of the farmer for turning his land to profitable account by the production of winter mutton, the amount of mutton that it is possible to produce from the crops grown upon one acre will now be shown from authentic data.

Selecting for our ration corn silage, clover hay, and oats, and basing our calculations upon an acre producing 6 tons of fodder corn, 2 tons of clover hay, or 33 bushels of oats, the relative portions of an acre for growing each of these feeds will be for the corn, 16 per cent, for the hay, 31 per cent, and for the oats, 53 per cent. This will give an average product per acre of 1,920 pounds of silage, 1,240 pounds of clover hay, and 630 pounds of oats. With a daily ration of 3 pounds of corn silage, 2 pounds of clover hay, and 1 pound of oats, the produce from an acre will feed one sheep 630 days. The ration given is the maximum amount that a matured sheep, weighing 175 to 200 pounds, will consume. A less quantity will suffice for younger sheep, and better gain for food eaten will be obtained. Accepting as a basis for calculation the average results obtained in experimental sheep feeding by the various stations with rations not altogether dissimilar to the one herein given, it will be found that the increased weights obtained will range from about 9 to 15 pounds for 30 days' feeding. This, then, will give us an average gain of 12 pounds per month. It will be noted that an acre is capable of producing sufficient feed to supply the wants of a fattening sheep for 630 days, or 10 sheep 63 days. Allowing a gain of 12 pounds per head for every 30 days, we have, as the result of the feed from 1 acre, a gain of 252 pounds, live weight, worth at least \$10.08. This does not represent the full amount of feed that an acre is capable of producing during the whole year, as no account has been taken of the aftermath in the clover, or of the value of the rape, wheat, or rye, as a fall and winter pasture, which can be produced in addition to the corn. While this does not represent very large direct returns from the land, it is of interest from the fact that this system of farming in conjunction with wheat growing will put off the day of purchasing artificial fertilizers almost indefinitely.

Pasturing winter wheat.—In the spring of 1899 the Oregon Experiment Station, in an endeavor to ascertain the value of winter wheat for pasture, as well as to note the effects of the pasturing upon the yield, selected a uniform plat of $2\frac{1}{2}$ acres of wheat, which was divided into two equal parts by means of hurdles; upon one part were turned 11 matured sheep, 9 lambs, and 3 calves. These were kept there without any other feed for two weeks until the wheat was pastured

down very closely. During their stay on the wheat the aggregate gain in live weight was 200 pounds, with a commercial value of \$8. The lot not pastured yielded only 1 bushel more wheat than the pastured lot. Thus it will be seen that in western Oregon winter wheat can be turned to good account as a spring sheep pasture. Prime muttons are frequently taken directly from the wheat field to the shambles without grain feeding; a supplementary daily grain ration of one-half pound, however, would be followed with better general results.

There are but few agricultural sections wherein the natural conditions are more favorable for the economical production of mutton in the winter months than western Oregon and the coast counties of Washington. Eliminating the advantages these sections possess in their wheat fields for supplying inexpensive, succulent, nutritious feed for the flock, there are still other avenues open to the farmer for producing mutton cheaply. In these sections clover, vetch, peas, fodder corn, and the cereals grow abundantly, and no better feed than these need be sought for fattening sheep in the winter.

MANAGEMENT OF BREEDING EWES AND LAMBS.

Winter management of breeding ewes.—Breeding ewes should be kept separated from the rest of the flock, and care should be exercised to prevent them from entering winter in an emaciated condition. The temptation is great for the farmer to put off the feeding of the flock to the latest possible period in the fall or winter. This, however, is a serious mistake, as the frozen, nonnutritious grasses are totally insufficient to sustain the bodily wants of the animal, and a rapid wasting of flesh too frequently ensues. The loss of flesh resulting from this treatment is always expensive to regain, as with reduced vitality comes impairment of the organs of digestion and assimilation. The time of changing from pasture to winter feed is often a critical period in the life of the sheep, especially so when no provision has been made to supply succulent feed in the form of roots and silage. An excellent plan to assist in modifying the injurious effects of these changed conditions is to commence feeding the flock light rations of oats upon the first appearance of severe autumn frosts. Surprisingly good results will be obtained by feeding one-half pound of oats per head while the ewes are yet on pasture. This will keep them in good condition as well as familiarize them with trough feeding, which is no small item in preparing the flock to enter their winter quarters.

Much diversity of opinion prevails as to the advisability of the winter housing of sheep in this climate, but the preponderance of evidence based upon experience is decidedly adverse to a general practice of housing the mutton breeds. If housed at all it is best merely to provide an open shed for the purpose of keeping dry, for convenience in

feeding, and for supplying comfort for the flock while eating. There should be no evil results following the proper housing of sheep. In a warm, humid winter climate close housing is entirely out of the question, and if adopted evil results will inevitably follow. If ewes of the large mutton breeds are to be housed, a floor space of at least 15 square feet for each ewe should be provided, and 20 or even 25 feet would be better.

Space at the feeding rack should be governed by the size of the ewes. Large ones, weighing from 175 to 225 pounds, require a space of $1\frac{1}{2}$ feet. Smaller ones require proportionately less. For best results, the building should be cleaned out every day, as nothing is more repulsive to sheep or more injurious to their health than a befouled pen, from whose floor noxious gases are continually emanating. Especially will this be the case when succulent feed is being fed, as the excessive amount of liquid and semisolid excretions will quickly develop a condition of absolute nastiness. The practice of covering this daily with fresh bedding is not to be commended, as the heat developed from their bodies when lying down causes foul gases to arise, which are inhaled by the sheep with baneful effects. This can in a measure be kept under control by the daily application of gypsum, but a thorough cleaning out of the pens every day will be found much more satisfactory in the end.

The amount and character of the feed given should be governed largely by the condition of the ewes, and, if for any reason they are permitted to enter their winter quarters in thin condition, no time should be lost in getting them started on the road to improvement if a good crop of vigorous lambs is to be expected in the spring. If the ewes enter winter in good flesh, but little if any grain will be required until a few weeks before lambing time; hence it is the part of economy to have them in this condition at this particular season. All sudden changes of feed should be studiously avoided, and the flock should be brought by degrees to changed conditions. For ewes weighing 175 to 225 pounds a ration of 3 to 4 pounds of corn silage and $2\frac{1}{2}$ pounds of nicely cured and not overripe clover or vetch hay will be ample to sustain them in prime condition up to within a couple of weeks of lambing. At this time for best results slightly less silage and hay can be fed, and a supplementary feed of 1 pound of equal parts of bran and oats may be added.

The ewes should have daily exercise, and a good plan is to drive them carefully some little distance to pasture that has not been heavily stocked during the summer, as they delight to roam over such ground to pick out the green and tender blades from among the old dried grasses.

Spring and summer management of ewes and lambs.—When the season arrives for turning the ewes and lambs upon winter wheat or other pasture, the grain feed should be continued for some time, as well as a light ration of hay. This will counteract the oversucculency of the green

feed and prevent possible derangements of the digestive organs. Lambs make a remarkable growth and matured sheep take on flesh very rapidly upon the wheat pastures. It is not unusual for lambs to make a daily gain of three-fourths to 1 pound for the first thirty days, and they frequently weigh from 45 to 50 pounds at two months old.

A farmer living near Monmouth, Oreg., recently marketed a carload of lambs averaging 140 pounds. The age of these lambs ranged from 6 to 8 months. They ran with their dams in the early spring on winter wheat and rape, and later in the season upon rape and clover. This is not an unusual weight for lambs in this section, reared under similar conditions.

As the time approaches for weaning the lambs ample provision should be made to guard against any possible check to them as this is a critical period of their life. Weaning them upon rape and clover has given excellent results. The method employed was to provide a nice piece of rape adjacent to a good growth of second-crop clover, and when the lambs are turned in upon this they appear indifferent as to the loss of their dams.

The early market lamb and the draft ewe.—The trade in the early market lamb has not developed into large proportions as yet in the Pacific Northwest, but with the ever-increasing population of our coast cities and the growing demand for this healthful and delicious meat, this branch of sheep husbandry is destined to become an important factor in the revenues of the farm. A good system for this work is to select in the early fall the ewes that are intended to be retired from the flock and place them upon a good piece of pasture, rape being preferable. Arrange to have them lamb early, not later than the last of January. The winter management should be practically the same as for the breeding flock, except that a more liberal quantity of grain should be given after lambing. Adjoining the shed or yard in which the ewes are fed a place should be set apart for the lambs, so constructed as to admit the lambs but exclude the ewes.

In this space a trough should be placed so that the lambs can not get into it with their feet, and a mixture of bran and oil meal in the proportion of 1 of the latter to 3 of the former should be kept in it.

When the lambs are ready for shipment to market, as they should be at the age of six to eight weeks, the ewes from which they are taken should be given but little if any grain for a few days, or until the milk secretions are materially checked. As soon as they give evidence of drying up, commence to gradually increase the grain feed until it is brought up to quite a liberal amount. It is highly important at this juncture to expedite their preparation for market with all possible speed, as at this season fat aged ewes will command a better price than at any other time of the year.

Fall and winter treatment of the lamb.—To secure perfect development in any animal, a steady, unchecked growth from the time of birth to

the age of maturity must be maintained, hence this fact should be kept well in view when the lamb is expected to improve or even maintain the standard of the flock. Experience has taught many breeders that it is economy to supplement the summer pasture with a slight grain ration for lambs. Whether this system of summer feeding is adopted or not, grain or other concentrated nutritious foods should be fed early in the fall and continued throughout the winter. The best fall pastures that the farm affords should be selected for the lambs, and every precaution taken to have them enter the winter in the best of constitutional vigor and thrift. The winter treatment should be somewhat similar to that given the older members of the flock with the exception that, if it is within the range of possibilities, a greater variety of feed should be given them.

HOG RAISING IN THE NORTHWEST.

By HIRAM T. FRENCH, M. S., *Agriculturist of the Idaho Experiment Station.*

INTRODUCTION.

Among the agricultural industries of the Northwest there are none which demand more thoughtful consideration than those involving the management of live stock.

We occupy that part of the United States which is farthest away from the source of supply of pure-bred stock. The countries of Europe are comparatively nearer than we are to the Atlantic seaboard, much nearer when the convenience of transportation is taken into account. This long and costly transportation is one of the hindrances to the introduction of blooded stock into the far West. It is true that within the past few years, it has been possible to obtain pure bred stock much nearer home, in the Middle Western States, and we are gradually realizing marked benefit from this westward movement of improved breeds of stock. Among the live-stock interests there is none, perhaps, more neglected and trampled under foot than that of raising hogs. This is true for several reasons, chief of which is that men come to this Western slope, and finding that corn is not as easily grown as wheat, or can not be grown at all, conclude that hogs can not be successfully handled. It is told of a farmer in a certain wheat-growing section, that when the price of wheat advanced to 60 cents per bushel, he took his hammer, knocked a hundred pigs in the head, and buried them, not realizing that some other cheaper grain might have taken the place of wheat, which, supplemented with some green feed, would have placed his hogs on the market in good condition, and at a profit. This no doubt is an extreme case, but it illustrates the tendency to neglect every other consideration when wheat sells at paying prices.

A few years ago it was a common practice for farmers to buy lard, hams, and bacon of the grocer who imported these products from the

great meat-packing centers. This habit is still followed in many sections where wheat constitutes the chief crop grown. When the price of wheat fell to 30 cents per bushel, the farmer, or rancher as he is termed in the West, of sheer necessity turned to the feeding of hogs; but when wheat advanced to 40 and 50 cents, and hogs were a drug on the market, farmers let go of the pig-raising problem and again turned their whole attention to growing wheat. So generally is this true, that to-day we are importing large quantities of pork products, hogs are worth 5 cents per pound on foot, and the farmer has none to sell. As already indicated corn can not enter into consideration as a food for hogs over large areas of this Western slope. Although in many sections the climatic conditions are not favorable for its growth, much more might be grown, and there is a rapid increase in the area devoted to this crop, grown both for grain and for green fodder to be stored in the silo. Many sections, including the irrigated districts, are raising as fine crops of corn as can be grown anywhere, not excepting the great corn belt; but these areas are as yet limited, and, as an industry for this section, corn raising has not yet passed the experimental stage.

The idea seems not to have gained a permanent footing that hogs can be successfully and profitably grown on other crops than corn or wheat. When wheat is high, we can not expect farmers to feed it to animals; but we can reasonably anticipate that he will turn his attention to feeding other grains to hogs, and thus supply at least the local demand for pork products. In some sections farmers are learning to grow more forage plants, such as peas, clover, vetch, rape, and other pasture crops for hogs.

BREEDS AND BREEDING.

On the Pacific slope much good food has been lost by feeding it to inferior animals. This is true of all kinds of stock, but especially so of hogs. In a statistical inquiry relative to the hog industry a few years ago, more than 75 per cent of the correspondents reported that the scrub hog prevailed. Within the past five or six years, however, great improvement has been wrought among the herds of swine found in the West. Berkshire and Poland-China blood predominates in the West. Chester-white, Duroc-Jersey, and Essex stock are also found scattered over these States. Recently the Yorkshire has been brought to the Pacific coast for breeding purposes. As a whole, little attention has been given to keeping the breeds pure. Blood will tell in pigs, as in any other kind of live stock. The old saying that "the breed is in the swill pail" or "in the corn crib" is no longer taken for more than half the truth among intelligent agriculturists. There is no breed of live stock which responds to the introduction of good blood quicker than hogs. The breeding of common-stock sows to pure sires of any of the well-known breeds, coupled with good feeding, will, in a few genera-

tions, produce nearly as valuable a pig for practical results as pure-bred animals on both sides. Cross-bred pigs of the Berkshire-Poland-China type have given very satisfactory results. Better returns, however, can be realized by keeping the breeds pure or by grading up with pure-bred sires. But the grading should be "up," and not "down," and this requires the best sires of pure blood.

A good sow is all important in obtaining satisfactory results. The sow must be a good milk producer. She must be a good mother in every sense of the term. Preference should be given to the sow having a rather long body, well-developed udder, teats evenly placed and plenty of them, ribs well sprung, and standing squarely on her legs, with hoofs upright. A sow, or any other breeding animal, with feet like sled runners should be avoided. Such animals will break down when required to carry the extra weight necessary at the fattening period. A brood sow bordering on the coarse order as she advances in age is preferable to a small, too finely-bred animal. The close, trim, compact sow will not give as satisfactory results as the type mentioned above. In selecting breeding animals of any kind of live stock, one general rule will apply: Select animals which will represent the type desired as closely as possible.

QUALITY OF PRODUCT.

The demand to-day is for a carcass with fat evenly distributed and not too thick on the back and shoulders, and having a large percentage of lean meat. When cut down the back, the fat should be as nearly as possible the same thickness throughout. Fat $1\frac{1}{2}$ inches thick and evenly distributed is more desirable than a heavier covering, especially if it is thicker at the shoulder than along the back. Hogs with heavy, thick fat over the shoulder are not of the type sought after in the markets to-day, especially for export trade.

More attention should be given to the quality of the production in pork than in all other kinds of meat. This is especially true in the Northwest, where our reputation for pork products is yet to be established. There are no precedents before us, and the foundation in breeding and feeding is yet to be laid. The matter of quality of product as affected by feed is a very important problem, and one which has not yet been solved by any means. That breeding proper types and forms is a very important consideration all admit, but of equally great importance is the matter of feed as affecting the quality of the product.

FEEDS AND FEEDING.

Clover and alfalfa pastures.—Common red clover is one of the most desirable forage plants for hogs and the one most commonly used in sections where it has been tried. Throughout western Oregon, Washington, and parts of Idaho, red clover will grow to great perfection.

Even in the irrigated sections of these States farmers are learning that red clover is a valuable crop. It is often mixed with alfalfa, giving good results. It will start quicker than alfalfa, and helps to furnish a variety, which is always desirable. Red clover will not furnish as much succulent food as alfalfa, for it will not make so many growths and will not remain green as long.

In some parts of the grain regions of eastern Washington and northern Idaho clover is claiming considerable attention. In the celebrated Palouse region, which is noted for its grain product, red clover is gradually gaining a foothold. In the vicinity of Moscow, Idaho, clover yielded last season from 13 to 18 tons of green forage per acre at a single cutting. These figures were obtained by careful weights and measurements in the field. A crop of clover like this would furnish one of the most valuable sources of food for pigs, both as to cheapness and excellence of material. In this way pigs can be pastured until the grain fields are ready for grazing. In many sections fences are not provided to turn pigs, but this is a matter which can be overcome at no great expense.

Where clover or alfalfa pasture is available the following plan may be recommended: Have the pigs farrowed about March 1. In six weeks turn sow and pigs on pasture, which, with a good supply of pure water and a little shorts, will keep the pigs growing very rapidly. With good pasturage, supplemented with grain or slop, including skimmed milk or whey, it is advisable to let the pigs run with the sow until 10 weeks old. The time should, however, be governed somewhat by the condition of the sow and the growth of the pigs. The weather conditions also should be taken into account. If the weather is stormy and cold the pigs will do better to run with the sow for a few days longer. The sow and pigs should be fed on slops made with shorts, or other mill feed, and water, before the pasture is ready to turn into. Skim milk will add to the value of this diet in sections where it is available. As a result both of experiments and practical experience it may be said that a small ration of grain is very desirable, in fact, almost imperative, with clover or alfalfa pasture, or with any other green forage crop. This will take the pigs through the summer to the time the stubble fields are ready to glean. At this point the grain farmer who has no pigs to clean up the scattered grain suffers quite a loss. In this Western country there is less care in harvesting, and hence the greater need of some stock to save the grain left in the field. The hogs can be sold directly from the stubble field, or better, unless the market is very attractive, they may be taken from the stubble, finished with ground grain, and placed on the market later in the season. The market is usually a little surer just before cold weather begins than it is a short time after. Pigs treated in this way can be made to weigh 250 to 300 pounds at 8½ to 9 months of age. Pork made in this way will be all that can be desired in quality, if good animals

are employed in its production. An acre of alfalfa or clover pasture fed in this way ought to produce from 600 to 750 pounds of pork.

Alfalfa hay.—It is not an uncommon practice to feed hogs on alfalfa hay, supplemented with grain. The alfalfa is usually cut up with a feed cutter, after which it is soaked or steamed and fed mixed with chopped grain. Alfalfa fed in this way aids digestion and causes the hogs to make greater gains than on grain alone. Hogs fed at the Kansas Experiment Station made a gain of 3.4 pounds for every 7.83 pounds of dry alfalfa over those fed on grain alone. In the report on this experiment the statement is made “that the gain from alfalfa hay with Kaffir corn meal fed dry over meal alone fed dry was more than 73 per cent.” These facts indicate that there are very satisfactory results to be obtained in a practical way from feeding alfalfa hay as a part ration for hogs. There are certain sections in Washington, Oregon, and Idaho where alfalfa is the chief crop, and in such localities these figures will be of special interest.

From May to August is the critical time for pigs in grain-growing sections. The pigs are often compelled during this period to hunt for a living, either in small inclosures, or in larger scantily productive pastures. Some very good pastures for pigs have been made by sowing winter wheat in the spring. If there is sufficient moisture the wheat will keep green and make a dense covering of succulent food. Pigs will not thrive in a pasture that is not green and fresh. Cabbage, rape, and vetch are excellent crops to supply succulent feed, especially the two latter crops. Rape will grow early in the season and make a cheap succulent crop, which the pigs will relish and thrive upon. In parts of Oregon and Washington the rape crop is being grown quite extensively for hog pasture.

Vetch.—Experiments conducted at the Oregon Experiment Station, in 1894 and 1895, showed very favorable results from feeding vetch or tares (*Vicia sativa*). In this feeding test pigs were fed on green vetch, with a part ration of shorts, from May 30 to July 28. During this time the animals made fair gains in growth and thus were prevented at small cost from becoming stunted, as many pigs do during this period. This vetch should be sown in the fall or winter throughout western Oregon and Washington. It may be sown in the spring, but the crop will be late. The most economical way to feed the vetch is to cut the material and feed it in pens or yards. In pasturing the crop, there is too much waste unless care is taken not to let the animals run over too large an area at one time.

Peas and oats.—Peas and oats mixed make a very good growth in many sections of the West, and furnish an excellent green food for hogs. This crop can be cut and fed in pens, or can be pastured off with less waste than is the case with vetch. Some farmers have been very successful in summer feeding in this way. Peas should be sown as

soon in the spring as the ground will work well. Good, rich soil that will not bake too much is the best adapted to growing peas. Sow 2 bushels per acre broadcast, and with a disk harrow or a plow cover to a depth of 3 or 4 inches. After a week or ten days sow one-half bushel of oats per acre and cover with a light smoothing harrow. This will level the ground and leave the peas at the proper depth, and at the same time break up the surface of the ground so that the peas may come up more readily. The oats sown after the peas have germinated will not be as likely to get the start of the peas. The oats grow faster at first than the peas, and thus have a tendency to choke them out. In sections where wild oats are plentiful the harrowing will be of great advantage in killing the oats which have started to come up.

Mixed rations for hogs.—To determine the feeding value of a mixed grain ration as compared with one of a single kind of grain, numerous experiments have been conducted, and in every case the results favor a mixed ration. This is one strong reason why a superior quality of pork can be produced in the Northwest, where such a large variety of grains and forage plants can be grown.

In corn-growing sections there is a disposition to feed corn almost exclusively on account of its cheapness, its fattening qualities, and the relish with which it is eaten. While in many sections we can not grow corn successfully as a grain crop, we can grow a long list of other cereals, such as oats, barley, wheat, millet, and rye; and we can grow them cheaply with very little danger of failure. As no artificial fertilizer is needed to grow these crops in the Northwest, the cost of production is low enough to make them cheap stock foods. A mixture of chopped wheat, oats, and shorts will give better results than a single grain of any sort, not excepting corn. A mixture of this kind is usually cheaper than wheat alone, and will produce better gains. Chopped oats should not be fed alone. The hulls interfere very materially with its value as food for hogs. They do not enjoy the hulls, and will refuse to eat the oats quicker than any other grain except bran, which they do not relish, principally for the same reason. Chopped barley and shorts make a good combination for feeding. A small amount of bran can be used to good advantage when mixed with other grains. Shorts alone will not furnish mineral matter enough for growing pigs.

Grain should be ground.—Small grain should be crushed or ground for hogs. When fed whole there is less gain to amount of food consumed, and the total gain in a given time will be less. It is a too common practice among farmers in this section to follow slovenly methods in feeding stock. Instead of getting a few feet of cheap lumber for a floor on which to feed, or making a few troughs, whole grain is strewn on the ground for the hogs to gather up as best they may. Often the rainy season begins before the hogs are sold; then the feed yard becomes a slough of mud, out of which the animals work very assidu-

ously to gather their daily food. This may be an extreme picture, but who has not seen it many times in this Western country?

In feeding experiments carried on at the Oregon Experiment Station in 1892, it was found that it required 1.2 pounds more of whole wheat and oats to produce a pound of gain in live weight than it did with ground grain fed under the same conditions. In many cases the excreta were examined to determine the amount of undigested whole wheat present, and it was found that as much as 50 per cent passed off unmasticated. This condition was more marked when the grain was fed dry, but at all times there was a very great loss.

Wet feed better than dry.—Hogs relish a moist diet better than a dry one, and will give better returns for the same food fed after soaking a few hours than when fed dry. Soaking grain from twelve to twenty-four hours pays well for the extra trouble in preparing the food. The old practice of permitting the feed to ferment and become a source of great annoyance, on account of the offensive odor it gives off, is no longer followed by the intelligent feeder.

Cooking food.—The practice of cooking grain for hogs has long since been discouraged as of doubtful economical value. Pound for pound, the raw grain will give the best results, and when the extra cost of cooking is taken into account, the results are very much in favor of feeding the grain raw. In case of vegetables it is quite different; for the feeding value as well as the palatability of most vegetables is improved by cooking.

Feeding potatoes.—Very often potatoes become so cheap, on account of an increased supply, that it would pay better to feed them to hogs than to sell them on the market. Hogs can be made to gain rapidly on a ration of cooked potatoes to which is added shorts, chopped wheat, oats, or barley. In experiments conducted at the Oregon station in 1896, pigs made a daily gain of 1.3 pounds on an average ration of 12.4 pounds of potatoes, and 2.8 pounds of chopped oats and shorts mixed half and half. The results of experiments indicate that the value of potatoes for feeding to hogs is about 10 cents per bushel. This value will vary, however, under varying conditions of market and methods of feeding.

Pumpkins for hogs.—Not much has been done in an experimental way in feeding pumpkins to hogs, but in practice many farmers in the West feed pumpkins very successfully. In 1898 experiments were carried on at the Oregon station to determine the value of pumpkins as a part ration for hogs, with the following results: They were fed from October 10 to December 25. The pumpkins were cooked and shorts were added to make the food palatable. The hogs gained 499 pounds, and consumed 7,523 pounds of pumpkins and 924 pounds of shorts. Placing the pumpkins at \$2.50 per ton, and the shorts at \$12 per ton, the total cost would be \$14.94. This makes the cost of 100 pounds of gain in live weight \$2. This is the cheapest pork produced from any combina-

tion of food materials tested at the Oregon station. The pumpkins were valued at the estimated cost of production. The pork produced by this feed was pronounced first-class for bacon purposes. The hogs were healthy and were never off their feed throughout the feeding period.

CONCLUSION.

Hogs free from disease.—Hogs in the Northwest are generally very free from disease. Hog cholera is practically unknown in Oregon, Washington, and Idaho. No well-defined cases have, so far as we are aware, developed within this region, although cases have been reported where hogs were imported from cholera-infected districts in the Eastern States. Our methods of feeding, together with a greater variety of food material, is conducive to the health of the animals. The comparatively small proportion of corn fed is an advantage to health. Corn, being a highly carbonaceous food, induces more animal heat, and should be mixed with some food rich in protein to give the best results, both as affecting the health of the animals and the quality of the product. Where wheat, oats, barley, peas, alfalfa, and clover, constitute the chief food supply, there is little danger of disease.

Prospect of the industry.—In conclusion it may be said that there is a broad field for the farmers of the Pacific Northwest to occupy in producing a superior article of bacon and other pork products. The climatic and feed conditions are the very best that can be found for producing a grade of pork which can not be excelled in the world.

There is not a day in the year, over large areas in this section, when hogs can not have some form of green succulent food. Pastures of clover, grasses, and annual plants can be provided that furnish a large amount of food which, supplemented with a small ration of grain, will produce a superior article of meat products. The foreign as well as the domestic market demands a better pork product, especially in the hams and bacon.

With good blood in the herd as the first essential, and then a proper food supply, the results will be wholly satisfactory.

THE HORSE INDUSTRY OF THE NORTHWEST.

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REVIEW OF THE PAST DECADE.

Many times during the past few years articles have appeared in various publications giving statements regarding the absurdly low prices at which horses have been sold in the States of the Northwest. As descriptions of the animals sold did not accompany these statements, in many instances the public got the impression that, no matter how good a horse might be, if placed on the market he would bring

only a few dollars. This condition greatly discouraged horse breeders, and caused many of them to discontinue this important industry. There was a general decrease in the value of horses during the years 1893 to 1897. It was, however, only in a few cases (involving the compulsory sale of very inferior horses, being either wild, unbroken range animals, or old horses that had nearly outlived their usefulness) that extremely low prices were paid.

Since the year 1890 the horse industry in this section has passed through three distinct periods. The first was from 1890 to 1893, inclusive. Thousands of horses roamed over the immense ranges, and all the owners did to guard their interests as producers was to have an annual round-up in the spring to brand the colts, and an occasional round-up when they wanted to sell a bunch of horses. During this period the value of the horse was good, averaging about \$60 per head. This price meant large profits for the producers, as it was not necessary for them to have any great amount of capital invested in lands, and the expense of raising the horses to a salable age was small.

The second period extended from 1894 to 1897, inclusive, during which the horse depreciated greatly in value, the average valuation being about \$20. Such a condition as this would have been reason enough to cause every horse raiser to cease breeding but for the fact that a general depression in values of all property existed at the same time. The depreciation in the value of the horse was not primary, but secondary to the great commercial depression then prevailing.

Since 1897 we have the third period during which the average valuation of horses has gradually advanced until at present it has reached about \$40, and everything looks favorable for a further rise.

The question which the horse producers of the Northwest, as well as of other sections of the country, must face is, "Will the price of horses advance so as to bring a fair return for the labor and capital invested in raising them?" The answer to this question will naturally depend on the supply of and demand for horses.

EFFECTS ON THE INDUSTRY OF NEW INVENTIONS.

Has the replacing of the horse by the electric street cars lessened the number of horses in use in this country? From 1887 to 1894, a period marked by great activity in street-railway building, and also the increased manufacture and use of bicycles, the number of horses increased from 12,496,744 to 16,081,139. This shows that, although the use of the horse decreased in particular directions, yet there must have been a healthy growth in their use in other directions. During this period the selling value of horses gradually declined from \$72 to \$48 per head. But this decrease was certainly not due to the number of horses thrown on the market as a result of displacement by electricity in propulsion of street cars and the general introduction of the bicycle, because we find that the values of other live stock—mules,

milch cows, and other cattle—decreased from 30 to 40 per cent during the same time. During the prevalence of the great commercial depression from 1893 to 1897 the number of horses in the country fell to 14,364,667. At the same time the value per head suffered a further decrease, the same being the case with sheep, swine, and cattle other than milch cows. The cattle interest was the first to recover, being followed a year later by the other stock interests.

Is it likely that there will be a continued demand for the right kind of horses? A great deal has been written about the probable displacement of the horse by the automobile, but it hardly seems probable that it will produce any more serious effect than have the electric street cars and bicycles. Each has its sphere of usefulness, and each will continue to have.

THE PRESENT AND PROSPECTIVE DEMAND.

What demands for horses can the Pacific Northwest supply? First of all there is the home market, to which further reference will be made. Then they are wanted for export; they are shipped north, west, and east. To the north they are sent into British Columbia and Alaska. The former takes a very good draft horse. The exportation to Alaska is at present small and includes a poor grade of horses, but it will undoubtedly change for the better as that country becomes more and more developed.

To the islands of the Pacific and the countries of Asia the shipment of horses is as yet not very large, but to Hawaii alone exportations increased in value from \$8,000 in 1893 to \$38,000 in 1897. With a definite knowledge of the type of animals wanted there, the States of the Northwest should certainly be able to produce a very desirable horse for that market at a better profit than any other section of the United States.

The Eastern market demands at present either a draft horse for export to Europe, or a lighter animal at a lower price to replace the one disposed of by Eastern breeders. This latter animal is the one that the Northwest has produced on its ranges at very little expense up to the present time. He is a medium-sized animal, a little rangy, but with good legs and feet; has a good constitution; and after being broken to work makes a good serviceable animal. His great fault in the eyes of the Eastern horse buyer is the blemish he carries from the branding iron.

There is no reason why a heavier and more desirable horse should not be furnished from here and a high market price be obtained for him. The ranges are gradually being settled and cultivated, so that the bands of range horses are becoming less numerous each succeeding year. As a result the raising of horses is gradually passing out of the hands of a few individuals to be taken up by many as fast as the increased price of horses justifies.

THE HOME MARKET.

What will the market in the Northwest be? The market for heavy draft horses will be in the large logging and mining camps that use thousands of horses annually; in the cities and towns horses will be wanted for heavy and medium fancy teaming; the lighter breeds will be in demand for light teaming and for family and fancy driving.

In order to obtain a high market price for any horse it is absolutely necessary that he be individually good for his purpose, whether it be for heavy or light draft or for driving. In addition he must be sound and stylish. The very heavy horse, that will serve well to move slowly great loads on the smooth roads of cities or towns, will be of less value in the logging and mining districts where rough roads make it necessary that the horses used be active as well as large. The same remark will apply to drivers. The small, smooth driver fills its own place, but can not replace the larger, coarser driver for country use. The home market, then, requires for logging, mining, and contracting a heavy horse, weighing from 1,450 to 1,700 pounds, having a good, round barrel, being short in the back, having good feet, solid legs, and shoulders set fairly well up so as to give considerable action; a horse that will draw a fair-sized load, and when it is required of him can trot down a rough mountain road without stumbling and falling. An animal of the above description that has good style, the head and neck being well set, will also do for fancy teaming in the city, where a team is often used as an advertisement as well as for work.

Such horses can in all probability be produced by choosing out of our native stock certain mares weighing about 1,400 pounds and crossing them with Percheron stallions or with selected English shires or Clydesdales. At present, unless the selections are carefully made, the crossing of our native mares with Clydesdales gives a horse that is very large, not having extra good style, narrow in the chest and across the withers, rather long in the back, but with good rump and legs; an animal that looks massive and that will draw great loads, but is not very active and trots hard. They are, however, quite easily matched and find fair sale in the cities for heavy teaming.

In the line of drivers the market demands for heavy work a horse that weighs from 1,100 to 1,250 pounds, is strong and active, of good color and style, one that with its mate will take the carriage along at a 10-mile-an-hour gait if necessary. This horse when very gentle will also make a valuable animal for family use.

I believe the Northwest can produce such an animal by crossing selected 1,050 to 1,200-pound mares, of good color and action, with either a French coach or a Cleveland bay stallion. Such a cross would without doubt give as a result an animal having great endurance, in addition to the other qualities demanded by the market. In the same way a driver with about the same qualities as the above, but lighter and consequently a little more active—one that would go well in single or

double harness to a light buggy, and if called on could step along at a 12-mile-an-hour gait—could be obtained by crossing selected native mares with either a hackney or trotting stallion. The hackney would probably give the better style and action.

Granting that the extensive horse raiser is gradually losing the range for running large bands, whom will it pay to raise the different kinds of horses that have been described, and for which there appears to be a good market?

It must be the farmer, whether large or small, and each should produce horses of a particular kind. It will pay the farmers of the Northwest to keep on their farms a number of good mares and breed them to good stallions that they believe will bring them an offspring of a certain type, for which there is each year a market at a good, fair price. It will also pay the small farmers and gardeners near cities to use for their work lighter mares, which may be bred to stallions of driving strains, and thus be able to furnish the material for drivers for the market. It should be remembered that it costs no more to raise a good horse than it does a poor one.

Acting on the valuable information continually gathered and distributed through the United States Department of Agriculture regarding the kind of animals wanted for export to the various countries, and having native stock with such great endurance and with such excellent legs and feet, the horse breeders and horse raisers of the Northwest should have no great difficulty, by judicious breeding to sires of style, color, and action, in producing horses that will command a high price in the markets of the world.

FARMERS' BULLETINS.

The following is a list of the Farmers' Bulletins available for distribution, showing number, title, and size in pages of each. Copies will be sent to any address upon application to Senators and Representatives in Congress or to the Secretary of Agriculture, Washington, D. C.:

16. Leguminous Plants. Pp. 24.
19. Important Insecticides. Pp. 32.
21. Barnyard Manure. Pp. 32.
22. The Feeding of Farm Animals. Pp. 32.
23. Foods: Nutritive Value and Cost. Pp. 32.
24. Hog Cholera and Swine Plague. Pp. 16.
25. Peanuts: Culture and Uses. Pp. 24.
26. Sweet Potatoes: Culture and Uses. Pp. 30.
27. Flax for Seed and Fiber. Pp. 16.
28. Weeds, and How to Kill Them. Pp. 32.
29. Souring and Other Changes in Milk. Pp. 23.
30. Grape Diseases on the Pacific Coast. Pp. 15.
31. Alfalfa, or Lucern. Pp. 24.
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55. The Dairy Herd. Pp. 24.
56. Experiment Station Work—I. Pp. 31.
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66. Meadows and Pastures. Pp. 28.
67. Forestry for Farmers. Pp. 48.
68. The Black Rot of the Cabbage. Pp. 22.
69. Experiment Station Work—III. Pp. 32.
70. Insect Enemies of the Grape. Pp. 23.
71. Some Essentials in Beef Production. Pp. 24.
72. Cattle Ranges of the Southwest. Pp. 32.
73. Experiment Station Work—IV. Pp. 32.
74. Milk as Food. Pp. 39.
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